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Protecting Peanuts from Aflatoxin

Peanut farmers could soon have a biological pesticide for protecting their crop's prized seed from fungi that produce aflatoxin—the chief culprits being *Aspergillus flavus* and *A. parasiticus*.

Circle One Global, Inc. (COGI), of Cuthbert, Georgia, has applied for an exclusive license on an ARS technique for making the biopesticide from spores of a nontoxigenic, or benign, strain of *A. flavus*.

In Florida, Georgia, and Alabama—top peanut-producing states—aflatoxin outbreaks from 1993 to 1996 caused losses averaging $26 million annually, ARS economist Marshall C. Lamb estimates. The Peanut Administrative Committee strictly regulates the sale or use of shelled peanuts having above 15 parts per billion of aflatoxin. Those peanuts can't be used in edible products, and shellers receive a much lower price for them.

Currently, there's no direct action peanut farmers can take to control fungi that produce aflatoxin. But ARS researchers are hoping to change that by helping COGI commercialize a biopesticide that peanut farmers can apply to their fields.

The approach is known as biocompetitive exclusion, explains Joe W. Dorner, a microbiologist in charge of the project at ARS' National Peanut Research Laboratory, in Dawson, Georgia. It involves formulating the benign mold's spores and seeding them into soils around peanut plants. There, by colonizing the peanut pod zone, the mold becomes a living shield against toxigenic fungi.

It may sound simple, but Dorner and ARS colleagues spent 14 years developing the technology and researching ways to make it commercially feasible.

One of the biggest challenges was finding a fast, cheap way of mass-producing the biopesticide. Initially they tried solid-state fermentation, which involves growing the spores on a substrate of rice or another grain. But this proved expensive and time-consuming. Also, the substrate required sterilizing and drying before packaging.

In 1999, they switched to mixing the spores with soybean oil, then spraying them onto whole, hull-free barley kernels. Coated with diatomaceous earth, which is self-drying, the kernels become tiny, easily applied granules.

Not only does the simplified method eliminate costly machine-drying and sterilization, but it can also churn out several tons of product per hour at a minimum of raw-material costs per pound of product.

"This barley formulation serves as both a carrier to deliver the fungus and a substrate on which it can grow and produce spores that penetrate the soil," Dorner explains. In fields tests, applying the formulation at a rate of 20 pounds per acre curbed aflatoxin levels by 70 to 90 percent compared to untreated, control plots.

COGI plans to register the formulation as a biopesticide with the U.S. Environmental Protection Agency. Once registered, the product could become commercially available in the next couple of years, says COGI spokesman Ronnie Balkcom.—By **Jan Suszkiw,** ARS.

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